

TABLE OF CONTENTS

Introduction	2
Chapter 1 - Carpet Construction	3
Carpet Fiber Types	3
Construction Methods	4
Carpet Backing	7
Color, Pattern, & Finishes	9
Chapter 2 - Installation	12
Stretch-In Installations	12
Direct Glue Down and Double Glue Down Installations	13
Choosing an Installation Method	14
Chapter 3 - Maintenance	16
Types of Soil	16
Maintenance Program	16
Soil Prevention	17
Cleaning Programs and Methods	17
Spot and Stain Removal	18
Periodic Deep Cleaning	20
Glossary of Carpet Terms	22
Bibliography	36

INTRODUCTION

This handbook is intended to assist in the selection of carpet and carpet tile for use in all types of Air Force facilities except Military Family Housing. It begins with background information on the types of fibers used in carpet making, and continues with a discussion of the various methods of carpet construction, including appropriate applications for the various types of carpet. Chapter 2 contains information on installation techniques along with a discussion of the pros and cons of the various methods. Chapter 3 concerns maintenance. It begins with information on the various types of soil and then discusses the importance of developing a proper maintenance program. Soil prevention techniques and cleaning methods complete the chapter. An extensive glossary of carpet terms provides reference information for the handbook, and is followed by a bibliography of references for those wishing to further expand their knowledge of carpets.

1

CARPET CONSTRUCTION

The performance of a carpet is largely a matter of appearance retention. A carpet is initially selected because of its appearance (aesthetics), and its performance is judged on how well it retains that original appearance. Carpets manufactured today will suffer unacceptable deterioration in appearance before suffering unacceptable wear. How well a carpet will maintain its original appearance under normal wear and maintenance is one of the primary considerations in selecting new carpet. There are several factors that affect appearance retention/performance. Almost every carpet component and every part of the manufacturing process has an impact. The critical variables in carpet construction are: (1) pile fiber, (2) carpet construction method, (3) choice of backing, and (4) color, pattern and finishes. Each of these variables is discussed below. The fifth critical variable in carpet performance is maintenance, which is discussed in Chapter 3.

PILE FIBER

The basic element of any carpet is the fiber that is converted into yarn and tufted or woven to form the pile. Almost all carpet manufactured in the United States today is made from one or a blend of the five fibers listed below:

- Wool
- Acrylic
- Nylon
- Olefin (polypropylene)
- Polyester

Each of these fibers has positive and negative characteristics which should be considered in carpet selection.

Wool

Wool is the carpet fiber that has been in use the longest. It is the only natural fiber in extensive use, and is the standard by which synthetic fibers are judged, although it represents only a fractional part of the commercial market. It has inherent resiliency, and does not hold dirt and surface dust readily because of the scaly character of the fiber. In addition, it is naturally flame resistant, charring rather than melting or dripping. Its major disadvantage is the high initial cost. Lower cost wool blends have become popular in recent years. A common blend is wool/nylon, at a recommended ratio of 80% Wool to 20% Nylon.

Acrylic

Acrylic fibers have been little used in carpet recently. Acrylic is wool-like in appearance, but soils and mats easily. It is not recommended for commercial applications.

Nylon

Nylon is used for 70% of commercial carpets. Of the synthetic fibers, it is the strongest, the most resilient, and offers the best performance characteristics. It is resistant to abrasion, has the greatest resistance to crushing and matting, and is easy to maintain. Since it takes dye well, it also has the greatest styling flexibility. Carpets are made of either Type 6,6 or Type 6. The two types have different molecular constructions. Type 6 is softer and easier to dye, and Type 6,6 is harder (more resilient) and more stain resistant.

Most nylon manufactured in the United States is made by one of the following companies, and most carpet manufactured in the United States is made from nylon fiber produced by one of these firms. Fibers produced by these firms are referred to as branded nylon, and are

available to any carpet manufacturer. They are well understood and their performance is well documented. Non-branded nylon fiber should be specified only with extreme caution and after careful research. The primary branded nylons are:

Brand	Type
Monsanto Ultron	Type 6,6
Dupont Antron, DSDN, Pro Select	Type 6,6
ICI (Rarely seen in the United States)	Type 6,6
BASF Zeftron	Type 6
Allied Anso	Type 6
Camac Camalon	Type 6

Olefin (Polypropylene)

Olefin is a synthetic polymer fiber whose base is ethylene, polypropylene, or a similar substance. It has excellent strength and resistance to chemicals and is highly moisture and stain resistant. It is usually solution dyed. Olefin is very low in resilience, crushes and packs quickly, and is not recommended for heavy traffic or extended wear areas. It is somewhat less expensive than nylon and is recommended for projects with tight budgets or for short term installations.

Polyester

Polyester has excellent color clarity, retains its luster well, and is resistant to water soluble stains, but its crush resistance is poor. Polyester is more commonly used for residential carpet.

FIBER PERFORMANCE CHARACTERISTICS				
Characteristic	Branded Nylon	Olefin	Polyester	Wool
Color	Excellent	Limited	Good	Limited
Abrasion Resistance	Excellent	Excellent	Good	Fair
Resilience	Excellent	Poor	Poor	Excellent
Soiling	Very Good	Good	Fair	Good
Cleaning	Very Good/Good	Excellent	Fair/Good	Good
Spot Removal	Fair/Good	Excellent	Good	Fair/Good
Pilling	Excellent	Excellent	Poor	Good
Static Electricity	Poor/Very Good	Good	Good	Bad/Good
Allergy Problems	Good	Good	Good	Fair
Chemical Resistance	Good	Good	Good	Fair

CONSTRUCTION METHODS

There are many different carpet construction methods in use today. The construction method of a carpet has a major effect on the performance and appearance of the carpet. There are three carpet construction types acceptable for Air Force projects. These are tufted, woven, and fusion bonded.

Tufting

Tufting is the most widely used construction method. In tufting, loops of yarn are punched into a primary backing material and locked on the underside with a secondary latex backing. Tufted loop pile carpet has a greater potential for snagging and running than woven carpet.

Weaving

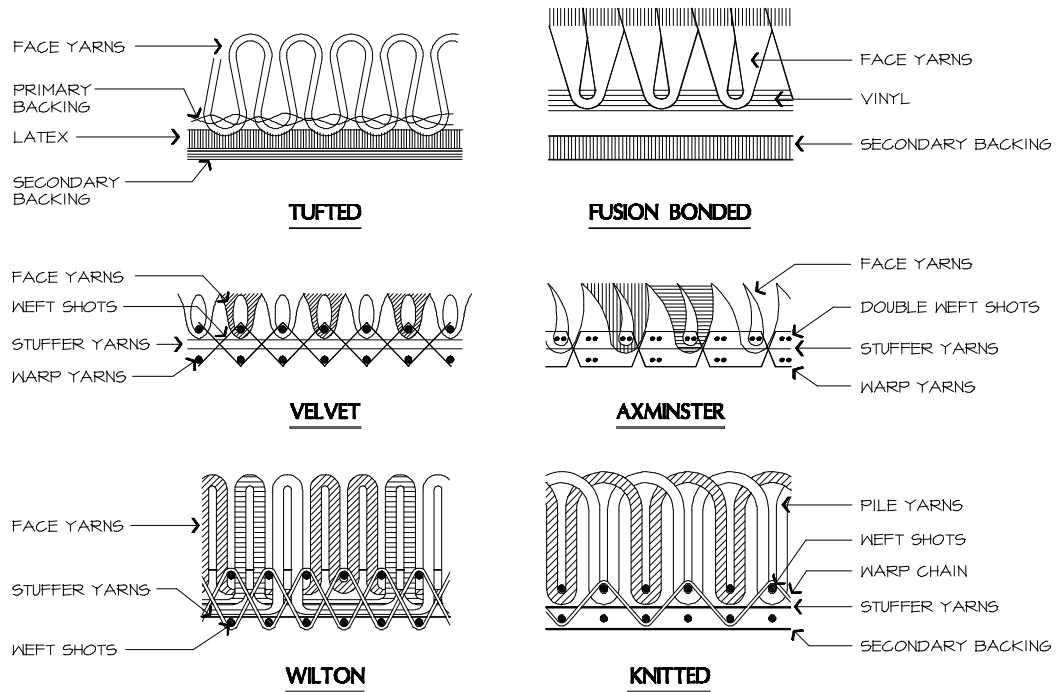
Weaving is the second most popular method of construction. The pile yarns are interlaced in one of many different techniques, each of which gives a different appearance to the carpet. Woven carpets are generally more expensive than tufted carpets, but have better appearance

retention. Woven carpets also require less pile weight to achieve the same performance as tufted carpet. Some types of woven carpet are Velvet, Wilton, Axminster, and Knitted.

Fusion Bonding

Fusion bonding is a newer method of construction than tufting or weaving. Yarn is embedded between two parallel sheets of adhesive coated backing, which are then split apart, forming two sheets of cut pile carpet. This type of carpet has a higher density so it usually performs very well. Bonded carpet is available in both carpet tiles and six foot or twelve foot wide roll goods.

Construction Modes



Performance Factors

There are several variables in carpet construction which affect wear and appearance retention and which are measurable. These performance factors are discussed below.

Density

Carpet density is a key factor in soiling and resiliency. In an adequately dense pile, dirt will remain on the surface so that it is easily vacuumed away. In addition, more compact fibers are less likely to crush since the tufts tend to support each other in the upright position.

Density is determined by the number of tufts (stitches) per unit area and the size of the yarn in the tufts. These factors are called gauge, pitch, stitches per inch, and yarn count. Pile density is the amount of pile yarn in a given area of carpet face. A useful formula is:

$$\text{Average Pile Density} = \frac{36 \times \text{Pile Yarn Weight}}{\text{Pile Height}}$$

See Table 2 in the ETL 94-3 Air Force Carpet Standard for recommended density factors.

<i>Gauge</i>	<p>The gauge of a tufted carpet is the number of tuft rows (rows of stitches) across a unit width of carpet. Gauge is obtained by counting the number of ends of yarn in one inch across the carpet and then taking the inverse of that number (I. e. one over the number.) For example, if a tufted carpet has eight ends of yarn per inch, the gauge is 1/8. If it has ten ends of yarn per inch, the gauge is 1/10. The smaller the gauge, the more dense the carpet. 1/10 gauge (10 tufts per inch of width) is more dense than 1/8 gauge (8 tufts per inch of width). Tufted carpet should have a minimum of 1/8 gauge or 1/10 gauge for good appearance retention.</p>
<i>Pitch</i>	<p>The density of woven carpet is described in terms of pitch. The pitch of a carpet is obtained by counting the number of ends of yarn in 27 inches of width.</p> <p>To convert gauge to pitch, take the inverse of the gauge and multiply by 27. For example, if the gauge is 1/8, taking the inverse gives 8, and multiplying by 27 gives a pitch of 216. To convert pitch to gauge, divide the pitch by 27 and then take the inverse.</p> <p>A good method of comparing carpets is to bend each carpet as it would be bent over the nosing of a stair tread and compare the amount of backing material exposed. Better carpet will have closer spaced tufts.</p>
<i>Stitches per Inch</i>	<p>Density is also affected by the number of stitches per unit length of tuft row. The number of stitches (tufts) per running inch of carpet is usually specified directly for tufted carpet, but is called "rows per inch" for woven carpet.</p> <p>Multiplying tuft rows per inch of width by stitches per inch of length will result in the number of tufts per square inch, or tuft density. Equal tuft placement gives the best performance, i.e., stitches per inch of length should be approximately equal to rows per inch of width. A high quality tufted carpet should have a minimum of 56 tufts per square inch.</p>
<i>Yarn Count, Twist, and Heat setting</i>	<p>The yarn count (or size) is an important factor in determining carpet quality. The larger the yarn for a given construction and pile density (that is, the more weight per unit length), the denser and heavier the carpet will be.</p> <p>Yarn twist and heat setting are extremely important for cut pile carpets. The yarn is first twisted and then heat set, giving it a springy character. This gives the carpet resiliency, enabling it to spring back when stepped on. A loose twist or a poor heat set will cause the carpet to mat and tangle. Five or more twists per inch is recommended for good appearance retention in cut pile carpet.</p>
<i>Pile Height</i>	<p>Pile height in tufted or bonded carpet is measured from the primary backing to the top of the tufts. In woven carpet it is the measurement between the steel blades on the loom on which the tufts are formed. If the carpet is multilevel, all pile heights should be specified. A low level loop performs best for severe wear applications, while a high pile gives a feeling of luxury. Carpets with low, dense piles will crush less than those having higher piles.</p>
<i>Pile Yarn Weight</i>	<p>Yarn weight is the amount of yarn, including buried portions of the pile yarn, that is contained in one square yard of carpet. This weight is usually given in ounces. Since some yarn is lost in production, the specifier may want to determine if the weight given is the finished weight or the tufting specification. Pile yarn weight should not be confused with total finish weight. The total finish weight includes all backing materials, latex, foams, topical finishes, and face yarns, and is not necessarily indicative of quality.</p>
<i>Surface Texture</i>	<p>The texture of a carpet is the combined effect of the visual and tactile surface characteristics. Surface texture is not merely an aesthetic factor, but also impacts the appearance retention of carpet. The most common textures are defined below:</p>

- Level Loop Pile: Single level, uncut loop pile that makes a smooth and level surface. It offers excellent wear resistance, but shows dirt, stains, and lint easily.
- Multi Level Loop Pile: This texture is constructed with two or more different height loops. The texture hides footprints, dirt, and dust better than a level loop, but may show crushing and compression with wear. Sometimes a pattern is created using the different heights of tufts, or the levels may be random, creating a texture.
- Cut Pile: This type of carpet has an upright pile with cut ends. This forms an even surface that is subject to shading, the illusion of color change caused by bent yarns reflecting light in different directions. The specifier should examine the cut pile carpet from several different angles and directions if color is critical. Difference in the amount of twist in the yarn creates different looks, such as:
 - a) Plush Finish: Made from yarn with very little twist which leaves a very smooth finish surface where tuft ends blend together. It is sometimes called "velvet plush." Velvet plushes show shading depending upon how light hits the pile. Shading is normal for this style and adds richness to the color.
 - b) Saxony: Uses yarns of two or more plies, twisted together and heat set to lock the twist into the yarn, thus giving it stability and permanency. This results in a distinctive appearance quite different from velvet plush because each tuft end is distinguishable on the surface.
 - c) Frisé: (Pronounced free-zay) Composed of tightly twisted, well defined yarns that give an overall nubby or pebbly texture. Carpets of frisé design wear well and do not have the pronounced shading effect that other cut piles exhibit.
 - d) Shag: A carpet texture characterized by long pile (1 1/2" to 3") tufts laid over in random directions in such a manner that the sides of the yarn form the traffic surface. Modern shags are made from plied, heat set yarns and can be either cut pile or cut and loop styles.
- Cut and Loop: An infinite variety of surface textures can be achieved by combining cut pile with loop pile. Tip sheared, random-sheared, and sculptured effects can be achieved by combining different loop heights and varying the cut pile areas.

CARPET BACKING

Carpet backing gives carpet dimensional stability. The term backing has a different meaning for woven carpet than it has for tufted carpet.

Woven Carpet

Backings for woven carpets consist of yarns called stuffers that are interwoven with the face yarn during the construction process. Polypropylene yarn is used as the primary backing for woven carpets. A latex backcoating or foam is added for maximum stability. Since the yarns are interlocked components of the carpet, a secondary backing is not required. Woven carpet is not subject to the delamination and long yarn runners that can affect tufted carpeting.

Tufted Carpet

In tufted carpet, the primary backing is woven or non-woven fabric into which the pile yarn is inserted by the tufting needles. A secondary backing of woven or non-woven material is adhered to the underside of the carpet, providing additional tuft bind and dimensional stability. Secondary backings are usually made of jute or man made materials such as polypropylene, latex foam, thermoplastics or vinyl. For carpet tiles, polyvinyl chloride,

amorphous resin, ethylene vinyl acetate, polyethylene, asphaltic bitumen, or polyurethane are used. Jute backing is not recommended under any circumstances since it is an organic material subject to mildew, odors, bacterial growth, stretching, delamination, and deterioration. Jute should be especially avoided in climates with high humidity.

Unitary backing is another type of tufted carpet backing. It consists of a chemical backcoating without an added secondary backing. Unitary backed carpet is most appropriate for glue down installations.

Tests for Carpet Backing

There are several tests performed on carpet backing that indicate quality and suitability for a particular application.

- **Tuft bind:** Tuft bind is the amount of force required to pull a tuft from the carpet. This measurement is important to consider when selecting carpet for high abuse areas such as schools or child development centers where there is a potential for unraveling. The minimum tuft bind, in average pounds of force, should be 10 pounds on any single pull, 12 pounds average on 8 pulls for loop pile, and 3 pounds for cut pile. Testing is done according to ASTM Method D13357, "Tuft Bind of Pile Floor Coverings."
- **Peel Strength of Secondary Backing:** Testing is done according to Federal Test Method Standard 191, Textile Test Method 5950. The minimum acceptable peel strength is 3.35 pounds/inch.
- **Dimensional Stability:** A suitable test for measuring the stability of finished broadloom carpet has not yet been developed. Dimensional change is rarely encountered with glue down installations, and is seldom a problem when power stretched carpets are properly installed. A dimensional stability test for carpet tiles is the Aachen Test. It consists of four individual tests in both the machine direction and the cross direction. The required result is the average of the four tests and should be ± 0.027 .
- **Tear Strength:** Testing is done according to ASTM D2261-64 "Tearing Strength of Woven Fabrics." The minimum acceptable tear strength in both length and width is:

Carpets for Glue Down Installation: 25 lb.

Carpets for Power Stretch Installation: 35 lb.

COLOR, PATTERN, & FINISHES

The choice of carpet color has a major impact on the interior of a space. While choice of color is at the discretion of the specifier, color is also an important factor in appearance retention.

Observations on Selecting Carpet Color

- Color is the dominant impact of carpeting.
- The floor is the second largest color area in the interior.
- Color is affected by the kind of light it is seen in - daylight, incandescent light, or fluorescent light.
- Color is affected by the amount of traffic the carpet receives and how soiled it is..
- Extremes of color magnify soiling.
- Yellow, gold, and tan show more soiling.

- Patterns and mixtures of color show less soil than solid colors.

Color can be applied to carpet fiber at any one of three different times during the manufacturing process: before spinning the yarn, after spinning the yarn, or after weaving the carpet.

Dyeing Before Yarn is Spun

- Solution Dyed: The fiber is dyed in its liquid state before it is spun into yarn. The color becomes a permanent part of the fiber and will not fade or bleach out. The pre-colored fibers are supplied to the carpet mills by the fiber manufacturers. This method is common for olefins (polypropylenes), nylons, and polyesters.
- Stock Dyed: After the fibers are made, they are dipped into a bath of dye where heat and pressure force color into the fiber before it is spun into yarn. There is a wide range of color choices, but fibers dyed with this process are more susceptible to fading, bleaching out, and staining. This method is used in dyeing wool, acrylics, polyesters, and some nylons.

Dyeing After Yarn is Spun

- Skein Dyed: Yarns are spun into skeins, which are stored and dyed as orders are obtained. This method can be used for spun yarns, bulked continuous filament yarns, heat set yarns, and non heat set yarns of almost any fiber type.
- Package Dyed: This method is similar to skein dyeing, except that the yarns are wound on perforated packages and the dye stuff is forced under pressure from inside the package through the yarn. Package dyeing is used infrequently for carpet yarns.
- Space Dyeing: The yarn is treated with three or more colors along the length of the yarn. This gives the carpet pile a random pattern. There are three methods of space dyeing: *knit-print-deknit*, *warp sheet printing*, and *multicolor skein dyeing* (similar to the skein dyeing process described above).
 - a) In the knit-print-deknit method, yarn is knitted into a tube or sock which is printed on both sides, usually in diagonal and horizontal stripes. The sock is then unraveled, and wound onto tufting cones. Knit-print-deknit is often used for loop style, contract carpet.
 - b) In warp sheet printing, yarns are unwound from a beam and carried side by side under the print rollers that apply the diagonal and horizontal stripes in varying widths. The yarn is then wound onto cones. Warp printed yarns tend to be straighter and leaner than knit-deknit yarns. This method is well suited to cut pile and cut loop carpet.

Dyeing After Carpet is Woven

- Piece Dyeing: Color is applied from a dye beck (stainless steel tank) onto unfinished carpet consisting only of primary backing and undyed yarns. Piece dyeing is generally for solid colors, but a tweed or moresque effect can be achieved in a single dye bath by treating some fibers to accept or reject certain dyes. Piece dyeing is generally associated with nylon and polyesters.
- Batch Piece Dyeing: This is similar to piece dyeing but the carpet is moved in and out of the bath by a motorized reel.
- Continuous Piece Dyeing: Dye is applied via a polished roller rotating in a continuously fed, full width dye trough. The full width of the carpet moves under the applicator. Continuous piece dyeing requires great skill and operational care.

- Random Multicolor Dyeing: This is similar to continuous piece dyeing but the applicators are modified to control the flow of dyestuff. This method creates random, multicolored patterns. The machines for this process were developed by the Kusters Corporation of Germany, and are called TAK or Multi-TAK applicators.
- Printing: Carpet printing is similar to textile printing but uses larger machines. There are three methods of printing - *roller printing*, *screen printing*, and *jet printing*. Printed carpet can simulate woven patterns at a much lower cost.
 - a) In roller printing the carpet is placed on a moving belt and dye is squeezed from a roll or drum through a pattern attachment.
 - b) In screen printing the carpet is placed on a flatbed and the dye stuff is forced through screens by an electromagnetic system.
 - c) Jet Printing: In jet printing, jets intermittently inject color into the carpet pile in response to signals sent by a computer. Designs are stored on magnetic tapes, and can be changed instantly. Jets can be used for continuous solid color dyeing, random patterns similar to those produced by TAK applicators, controlled geometric patterns, and oriental or other formal patterns.

Color Fastness

Dyes applied to carpet pile yarns are subject to chemical attack and the action of sunlight and atmospheric contaminants such as ozone and nitrogen oxides. There are several tests to assure that dyes are properly fixed on the pile yarn, that they will resist fading, and that they will not rub off when dry or bleed when wet. Dyes should also be unaffected by accepted industry cleaning methods. Carpets that meet the following standards can be expected to offer acceptable fade resistance in indoor applications.

- Light Fastness: AATCC Test Method 16E-1976. Shade changes after 80 standard fading hours (Xenon Arc) should not be less than an International Gray Scale Rating of 3.
- Crock Fastness: AATCC Test Method 8-1974. Minimum stain ratings, International Gray Scale, should be Wet: 4, Dry: 4.
- Wet Fastness: Dupont Carpet Spot Bleed Test. Run with both hard water and alkaline detergent. Stain or color change rating after two cycles in either test, should be no less than an International Gray Scale Rating of 3.
- Atmospheric Fading: AATCC Test Method 129-175. Ozone/AATCC Test Method 23-1975 - Burnt Gas. Minimum shade change after two cycles in each test should be no less than an International Gray Scale Rating of 3.

Patterned Carpet

Patterned carpet contains decorative ornamental or abstract forms and shapes. The pattern may be an integral part of the construction or may be applied through a printing process. Pattern can be incorporated through texture, color, or the combination of both. Patterns can enhance appearance retention by acting as a camouflage. They hide seams, mask soiling, and obscure traffic patterns.

In assessing carpet designs for appearance retention, random patterns are best, followed by regular geometric patterns, tweeds, heathers, and solid colors. Tweed designs contain two or more colors that are interwoven. They may be used where heavy soiling is not anticipated. Heather designs are similar to tweeds but much more subtle. The multicolor effect in heathers and tweeds is produced by blending fibers of different colors prior to spinning the

yarn. In a tweed, the multicolor effect is more pronounced because the actual yarn tufts are multicolored. In both cases, the more colors used the better the appearance retention that is achieved. Multicolored (more than two or three colors), patterned, and/or tweed carpet should be used for all high traffic areas that are subject to stains and spillage such as dining halls, child care centers and clubs. Solid carpet is only recommended for General Officers' office suites and distinguished visitors' (DV) areas in transient lodging facilities.

Observations on the Use of Pattern

- Avoid orienting geometric carpet patterns with predominant lines parallel to walls in areas of long proportion such as corridors, unless the pattern is installed as an inset. This prevents the appearance that the carpet is running askew to the walls and will also make the corridor appear longer.
- Be aware of the scale of the carpet pattern. Large scale patterns should generally only be used in large areas such as ballrooms, dining rooms, etc.

In areas where cigarettes or boot polish may be a problem, a carpet containing black, dark blue or dark brown in the pattern helps to camouflage any burns or stains.

Antimicrobial, Soil Resistant, and Stain Resistant Finishes

Chemical finishes are a recent innovation that has greatly improved appearance retention and ease of maintenance for carpeting. These finishes include soil resisters, stain resisters, and antimicrobial treatments. These protections should be built in so that the finish is permanent and never requires reapplication due to moisture, shampooing, or steam cleaning. Solution dyed carpet is inherently stain resistant. Antimicrobial treatments should be registered with the United States Environmental Protection Agency (EPA) for the express purpose of providing protection.

It should be noted that carpets will still require maintenance programs to preserve their appearance. No antimicrobial treatment will overcome unhygienic conditions of spilled food and dirt left unattended, and a soil resistant finish does not mean that a carpet is soil proof. A good maintenance plan is mandatory for all carpets.

2

INSTALLATION

A quality installation provides long lasting value, performance, and satisfaction. Installation should be performed by an installer approved and certified by the carpet manufacturer or by an experienced installation technician. The Carpet and Rug Institute has published a guidebook called How to Specify Commercial Carpet Installation. Carpet specifiers should refer to this volume and to CRI-104, Standard for Installation of Commercial Textile Floor Covering Materials for comprehensive installation information. These guides are available for a small fee through the Carpet and Rug Institute:

The Carpet and Rug Institute
PO. Box 2048
Dalton, Georgia 30722
(706) 226-2477 or (706) 278-3176

There are three principal methods of commercial carpet installation: *stretch-in*, *direct glue down* (including attached cushion), and *double glue down*. Carpet with attached cushion, secondary, unitary, or woven backing may be used for glue down installations. Separate cushion stretch-in installations are usually limited to woven carpets or tufted carpets with secondary backings.

The following issues should be considered when installing carpet:

Pattern Match - Extra carpet must be allowed when estimating quantities of patterned carpet needed. Even cut and loop effects, such as sculptured carpet, require matching.

Seaming - Care should be taken to avoid seams in high traffic areas such as doorways, hallways, and pivot points.

Stretch-in Installation

In the stretch-in method, carpet is stretched over a separate cushion using tackless strips at the outer edges of the area to hold the carpet in place. There may be problems with wrinkling or buckling, usually resulting from insufficient stretch during the initial installation, or from a cushion that does not adequately support the carpet. Adequate stretch can only be attained by using power stretchers. A firm, low profile cushion with small deflection should be used in commercial traffic areas. Cushions that are too thick and soft will permit carpet backings to stretch and eventually wrinkle.

Additional information concerning the correct amount of stretch for each carpet and the preferred type of cushion should be obtained from the carpet manufacturer prior to stretch-in installations.

Good seams are of the utmost importance for a quality installation. The manufacturer's recommendations must be followed closely. Most modern installations employ hot melt tape seams, but woven carpet constructions may require hand sewing or other specialized techniques. In all cases, cut edges should be buttered with the appropriate sealer prior to seaming.

Direct Glue Down & Double Glue Down Installations

Installations using adhesive can be made using carpet with an attached cushion or carpet without an attached cushion. Adhesive installations are better suited than stretch-in installations to heavy and rolling traffic conditions. Adhesive installations are also better suited to large open areas because of the considerable difficulty of stretching carpet over a large area.

Direct Glue Down Installations

This type of installation is used for carpet with or without an attached cushion. Carpet without cushion is inexpensive and provides adequate wear, good dimensional stability, ease of use for rolling equipment, and good stability for standing partitions in direct glue down installations. Carpet with an attached cushion provides good wear, greater softness underfoot, and better acoustics than carpet without an attached cushion. The cushion may break down, however, under severe wear conditions or when subjected to wheeled equipment traffic. If the cushion breaks down, the carpet may need to be replaced sooner.

Double Glue Down Installations

Double glue down installations combine cushion and carpet into a floor covering system by gluing the cushion to the floor and the carpet to the cushion. This method is popular since it combines the stability of direct glue down with the cushioning benefits of a separate cushion. The cushion must be a type that is designed for this method.

In both types of glue down installation, adhesive is applied to the floor to obtain the required 100% adhesive transfer into the carpet back. If too little adhesive is used, carpet will not adequately adhere to the floor. It is also very important to allow adequate open time for adhesives to develop tack prior to laying carpet. Ensure that proper glue and tape are used.

Moisture Problems

Moisture can prevent adhesion of carpet to floors, and can be present in both concrete and wood subfloors. It is extremely important to test for and correct moisture problems prior to glue down, since moisture may carry alkaline substances that can attack adhesives and destroy the bond between the floor and the carpet.

Indoor Air Quality

There has recently been a good deal of concern about indoor air pollution, which has led to questions about the relationship between carpet products and indoor air quality. Indoor air quality can be improved by taking the following steps during installation:

- Plan ahead.
- Ask the carpet supplier for information on emissions from carpet.
- If adhesives are needed, request low emitting ones.
- Use low VOC (volatile organic compounds) adhesives in all glue down installations.
- Use low VOC (volatile organic compounds) adhesives in all carpet tile installations.
- Ensure that the ventilation system is in full working order before installation begins.
- Be sure the supplier requires the installer to follow Carpet and Rug Institute installation guidelines.
- Open doors and windows, if possible, during and after installation.
- Consider using window fans, room air conditioning units, or other means to exhaust emissions to the outdoors.
- Operate the ventilation system with maximum outdoor air during installation and for 48 to 72 hours afterwards.
- Consider leaving the premises during and immediately after carpet installation. Schedule the installation for a time when most people will be out of the facility.

- Contact the carpet supplier if objectionable odors persist.
- Follow the manufacturer's instructions for proper carpet maintenance.

CAUTION: Some carpet tile backings have an adverse chemical reaction when they come into contact with the cut back adhesive that is used to install vinyl composition tile (VCT). Be careful to remove all adhesive from floor or to install carpet tile on top of VCT. This procedure will avoid the breakdown of the carpet tile backing and subsequent wicking of adhesive to the surface of the carpet tile.

*Choosing an
Installation Method*

Advantages of the Stretch-in Method:

- Patterned carpet is more easily matched
- Stretched carpet is more resilient than carpet that has been glued down.
- It extends carpet life.
- There is less crushing and packing of pile.
- It adds insulation value.
- It gives higher sound absorbency (NRC) values.
- It responds better to vacuuming.
- It can be used for floors that are not acceptable for glue down.
- Removal costs less than removal of a direct glue down installation.
- Corrective measures, such as seam repair, are easier to perform.

Advantages of the Direct Glue Down Method:

- The cost of the cushion is eliminated.
- The labor for direct glue down is usually lower in cost.
- It is suitable for rolling traffic and ramp areas.
- The seams are more durable since there is no vertical flexing.
- Buckling is minimized in buildings that have the HVAC turned off for extended periods, such as schools, churches, theaters, etc.
- Restretch is never necessary.
- It facilitates access to electrical and telephone lines under the floor.
- Seam peaking is practically eliminated.
- It is unrestricted by the size of the area, and is therefore suitable for large areas such as ballrooms, etc.
- Intricate borders and inlay are possible.
- It is better for handicapped accessibility.

Advantages of Direct Glue Down with Attached Cushion Method:

- Appearance retention and foot comfort are improved over direct glue down installations.
- Has high tuft bind capabilities.
- There is increased delamination strength and improved edge ravel resistance.
- It functions as an effective moisture barrier.
- Thermal and acoustical performance are improved.
- The second adhesive required for double glue down installation is not necessary.

Advantages of the Double Glue Down Method:

- It combines the stability of direct glue down carpet with the cushioning benefits of separate cushion stretch-in installations.
- It improves carpet appearance retention, foot comfort, and overall performance over direct glue-down installations.
- Carpet bordering and inlaying are simplified.
- It is suitable for wheeled traffic.
- It is unrestricted by the size of the area.